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*Publication date:*  
2000

[Link to publication in Tilburg University Research Portal](#)

*Citation for published version (APA):*

Belot, M. V. K., & van Ours, J. C. (2000). *Does the Recent Success of some OECD Countries in Lowering their Unemployment Rates lie in the Clever Design of their Labour Market Reforms?* (CentER Discussion Paper; Vol. 2000-40). Macroeconomics.

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Center  
for  
Economic Research

No. 2000-40

**DOES THE RECENT SUCCESS OF SOME OECD  
COUNTRIES IN LOWERING THEIR  
UNEMPLOYMENT RATES LIE IN THE  
CLEVER DESIGN OF THEIR LABOUR  
MARKET REFORMS?**

By Michèle Belot and Jan van Ours

April 2000

ISSN 0924-7815

# **Does the recent success of some OECD countries in lowering their unemployment rates lie in the clever design of their labour market reforms?<sup>1</sup>**

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April 2000

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## **Abstract**

The development of the unemployment rate differs substantially between OECD countries. In recent years some countries experienced a mild increase, other countries had a stable unemployment rate, while there are also ‘successful’ countries in which the unemployment rate decreased a lot. A common feature of the successful countries is that they implemented a *comprehensive* set of institutional reforms. In this paper we present a theoretical and empirical framework to investigate how unemployment is affected by different labour market institutions (LMI) such as labour taxes, unemployment benefits, employment protection, union bargaining power and (de)centralisation of bargaining. We argue that complementarities between LMI can be exploited to improve labour market performance. In our empirical analysis of annual data over the period 1960-1995 of eighteen OECD countries we show that interactions between LMI are indeed important.

*JEL classification* : E24, J68

*Keywords* : OECD, unemployment, institutions, complementarities, reforms

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<sup>1</sup> We thank for useful comments of Jan Boone, André Hoogstrate, Michael Krause, Bertil Holmlund, Stephen Nickell, Arthur van Soest, of participants of the June 1999 Institute for Labour Studies Workshop and of the 1999 EALE Conference in Regensburg.

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## 1. INTRODUCTION

There are substantial differences in the development of the unemployment rate between OECD countries. In North America, unemployment has an important cyclical component. There is a slight positive trend since the beginning of the 1970s. Unemployment rate has peaked at just 9.5 percent in the 1980s. It is currently around 7 percent and it is globally stable since the beginning of the 1990s. By contrast, unemployment in the European Union and in Oceania has risen sharply since the mid-1970s, appearing to be more structural than in the United States. The EFTA countries experienced an exceptionally stable unemployment rate until the end of the eighties. However, since then, unemployment has risen sharply to almost 8 percent. In Japan, the unemployment rate has always been much lower, between 1 and 3 percent.

Within this context of globally rising or at most stabilising unemployment rates, in recent years some countries have managed to reduce their unemployment rates substantially. Indeed, according to 1999 “OECD in Figures” and “Employment Outlook”, some encouraging developments were registered in the United Kingdom (12% in 1986, 6,2% in 1998), Ireland (17,8% in 1987, 7,7 in 1998), the Netherlands (12,2% in 1984, 4,2% in 1998) and New Zealand (10,3% in 1991, 7,5% in 1998)<sup>4</sup>.

It could be that some countries have a better labour market performance than other countries because they have a particular type of institutions or they changed some of institutions in a favourable way (see Nickell and Layard (1999) for a general overview and Nickell and Van Ours (2000a, 2000b) for an explanation of the success of The Netherlands and UK in reducing unemployment). If this is the case, then countries with high unemployment rates could learn from successful countries by imitation. However, as Freeman (1998) stresses, countries cannot just borrow some features from successful countries and expect the unemployment rate to decline since a particular institutional feature may perform differently depending on the overall institutional framework.

Institutions interact with each other, i.e. the institutional framework is not a set of independent elements. Calmfors (1993) shows how the effect of taxes can theoretically differ according to nature of the bargaining institutions. Coe and Snower (1997) argue that a wide range of labour market institutions have complementary effects on unemployment. They also point that if institutions interact with each other, policies also do. So it might be possible that some countries exploited policy complementarities and hence reduced their unemployment rates more than others did. Fitoussi et. al. (1998) underline that all recently successful countries have in common the implementation of a set of *comprehensive reforms*.

The objective of this paper is to investigate the existence of complementarities in more detail. We present a theoretical model that enables us to illustrate the mechanisms through which institutions interact and influence unemployment. We

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<sup>4</sup> These are the most recent data on unemployment rates. Because of lack of recent information about many of the variables we use, in the empirical analysis the most recent year covered is 1996.

also investigate whether there is empirical evidence on the existence of complementarities.

The paper is structured as follows. In section 2, we present a theoretical model of employment and wage determination. In section 3, we discuss the labour market performances of OECD countries and relate these in a stylised way to labour market institutions. In section 4, we present our empirical analysis based on eighteen OECD countries, over the period 1960-1995. Section 5 concludes.

## 2. LABOUR MARKET AND INSTITUTIONS, THEORY

In this section, we study the way institutions affect the labour markets in the context of the well-known right-to-manage model of wage bargaining. The institutions concern variables such as the labour taxes, firing costs, unemployment benefit system, and the degree of co-ordination and centralisation in the bargaining process. We investigate the direct effect of these institutions, but also consider their interactions, and show the existence of complementarities and rivalries.

### 2.1. Right-to-manage model of wage bargaining

We start our analysis by extending the traditional right-to-manage model of wage bargaining (Nickell and Andrews (1983)). The basic idea of a right-to-manage model is that wages are set by a bargaining between a union and a firm, and employment is *managed* by the firm alone, after wages are set. The wages are set so as to maximise the relative rents of both actors. We follow closely the line of reasoning in Layard, Nickell and Jackman (1991) and Booth (1995).

In our model, the economy is constituted of  $n$  perfectly symmetric firms ( $i=1,2,...,n$ ) and  $n$  unions. Each of the unions negotiates wages in one firm and bargains independently of the other unions. The case where  $n = 1$  represents the situation in which wage negotiations are centralised.

Firms will decide on the level of employment *given* the negotiated wage. We assume that the actors are perfectly informed on the firm's behaviour, in particular on the labour demand function. Since bargaining occurs before, the actors consider the level of employment in the firm as *endogenous* in the bargaining process. The first logical step consists in describing the firm's behaviour.

We assume that the firms produce a differentiated product. We characterise them by their degree of monopoly power on the product market  $h \in [0,1]^5$ . The reason why we introduce product differentiation is related to the wage bargaining process. We want to allow for various bargaining processes, i.e. at the firm-level, at the industry-level and at the central-level (defined by  $n = 1$ ). Firm-level and industry-level bargaining are distinguished according to their degree of monopoly power on the product market. We make the following assumptions. If bargaining occurs at the firm-level,  $h$  is considered to be 0, while if bargaining occurs at the

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<sup>5</sup>  $h$  is the inverse of the absolute price elasticity.  $h = 0$  corresponds to the perfect competition case.

industry-level,  $h$  is supposed to be higher. Indeed, what matters for the firms while negotiating is the degree of competition they face with firms not negotiating with them. At the industry-level, competition with firms of other industries is smaller.

We ignore capital and assume that the production function has a Cobb-Douglas specification,

$$Y_{i,t} = L_{i,t}^a, \quad (2.1)$$

$$P_{i,t} = (Y_{i,t})^{-h}, \quad (2.2)$$

for  $i=1, \dots, n$ ,

where  $Y_{i,t}$  is the production level,  $L_{i,t}$  the employment and  $P_{i,t}$  the product price of firm  $i$  in period  $t$ ,  $a$  is the parameter of the production function,  $a \in ]0, 1[$ .

We assume that in period 0 firms choose the entire future path of employment ( $T = t \in \mathbb{N}$ ), so as to maximise the present value of their profits:

$$\max_{L_{i,t}} \sum_{t=0}^{\infty} \left( \frac{1}{1+r} \right)^t [P_{i,t} Y_{i,t}(L_{i,t}) - (w_{i,t}(1+t+f)L_{i,t})], \quad (2.3)$$

where  $r$  is the exogenous discount rate,  $w_{i,t}$  the negotiated (net) wage which is exogenous to the employment decision of the firm,  $t$  the labour tax rate and  $w_{i,t}f$  are the firing costs per worker the firm has to incur at the end of the period.

The first order condition are:

$$a(1-h)P_t L_t^{a-1} = w_t(1+t+f), \quad (2.4)$$

$$\text{where } P_t = L_t^{-ah}, \quad (2.5)$$

and the labour demand function (=employment function) can be written consequently as:

$$L_t = \left[ \frac{1-m}{w_t(1+t+f)} \right]^{\frac{1}{m}}, \quad (2.6)$$

where  $m = 1 - a(1-h)$ .

Equation (2.6) shows that employment depends negatively on the net wage, the firing costs, the labour tax, the degree of monopoly power and positively on labour intensity. The latter parameter also determines the price mark-up over the wage and can therefore also be seen as an indicator of monopoly power. Consequently, we define the *effective* degree of monopoly power as  $m = 1 - a(1-h)$ . The degree of monopoly power determines the importance of the price mark-up

on wage costs. The higher it is the lower is the employment level required to reach the optimum profit.

With respect to the bargaining process, we assume the following chronology in decisions (Cahuc and Zylberberg (1994)):

1. At the beginning of the period  $t$ , wage bargaining takes place. In case of failure, workers are fired immediately. They get a chance of being employed in another firm or are unemployed for that period at least.
2. When a wage agreement has been reached, firms start producing and paying wages. When the bargaining procedure failed, firms do not produce anything.
3. At the end of the period  $t$ , firms incur costs associated with firing or adjustments. Workers who have been employed get a share of these firing costs.

We have already described how the firm was going to choose the employment level, *given the wage*. The wage is fixed in a bargaining process, where the actors are perfectly informed about firm behavioural mechanisms. The idea is that the actors negotiate a wage so maximising their respective rents, corresponding to the difference in utilities with and without agreement (bargaining failure). We assume that both actors are risk neutral, i.e. their expected utility corresponds exactly to the expected monetary payments and costs they incur.

Before specifying the respective rents of both actors, we define the expected utilities of an unemployed worker and of a worker in firm  $i$ .

We define  $U_t$  the expected utility of an unemployed worker in period  $t$  as follows:

$$U_t = b + \frac{1}{1+r} \left[ \sum_{i=1}^n L_{i,t+1} W_{i,t+1} + (1 - \sum_{i=1}^n L_{i,t+1}) U_{t+1} \right], \quad (2.7)$$

where  $b$  is the nominal unemployment benefit, applying to all unemployed, whatever their history and situation is.  $L_{i,t+1}$  is the employment level<sup>6</sup> in firm  $i$ , in period  $t+1$  and  $W_{i,t+1}$  is the utility of working in firm  $i$  in period  $t+1$ . The expected utility of the unemployed worker is equal to the sum of the present gains of being unemployed (unemployment benefit) and the future gains in utility. The latter depends on the future situation of the unemployed. Since all individuals are identical, we know that all the members of the labour force face the same probability of being employed at the next period, in one firm. With a complementary probability, they will not find a job in any firm and stay unemployed.

$W_{i,t}$ , the expected utility of a worker in firm  $i$  in period  $t$  is defined as follows :

$$W_{i,t} = w_{i,t}(1 + qf) + \frac{1}{1+r} \left[ \sum_{i=1}^n L_{i,t+1} W_{i,t+1} + (1 - \sum_{i=1}^n L_{i,t+1}) U_{t+1} \right]. \quad (2.8)$$

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<sup>6</sup> We assume a constant labour force, which we normalise to one, so the employment level corresponds to the probability of being employed in that firm.

where  $w_{i,t}$  is the bargained nominal wage in firm  $i$ . The worker receives a proportion  $q$  ( $q > 0$ ) of the firing costs incurred by the firm at the end of the period. The expected future is the same for everyone, so the second term in (2.8) is the same as in (2.7).

We now consider the utility of the unions. The unions represent the entire labour force. Assuming risk neutrality, the utility of a union is equal to the expected utility of a representative member. The question is: what can a representative member expect at the beginning of the bargaining process? First, there are two possibilities with respect to the bargaining process itself, since it may lead to a wage agreement or it can fail. We assume that in case of bargaining failure, nobody is hired. Second, if an agreement is concluded, the individual union member is still uncertain about whether he is going to be employed or not, and if he does, in what firm he will be working. We assume that the unions maximise the difference in their utilities in case of agreement and in case of failure.

First, let us consider the expected utility in case of agreement. We should keep in mind that the unions are firm specific but represent the entire labour force. What can happen to a representative member of the firm union  $i$ ? He can either be employed in that firm (with probability  $L_{i,t}$ ) or not (with probability  $(1-L_{i,t})$ ). If he is not employed in that firm, he can either be employed by another firm (with probability  $\sum_{j \neq i} L_{j,t}$ ) or be unemployed (with probability  $(1 - \sum_{j \neq i} L_{j,t})$ ). From the point of view of a particular union, the probability of being employed in another firm is *given*.

The expected utility in case of agreement is formally defined as follows:

$$\begin{aligned} \Omega_{i,t} &\equiv L_{i,t}W_{i,t} + (1-L_{i,t})A_{i,t} \\ \text{where} \\ A_{i,t} &\equiv \sum_{j \neq i} L_{j,t}W_{j,t} + (1 - \sum_{j \neq i} L_{j,t})U_t \end{aligned} \tag{2.9}$$

It is obvious that in the centralised case, there is not such other firm where workers can possibly apply. In the absence of alternative employment, the term  $A_{i,t}$  reduces to  $U_t$ .

Now we turn to the fallback position of the representative worker. If an agreement is not reached, we assume that the worker still has a chance to be employed in another firm. The default option is unemployment. The fallback position of a representative worker in firm  $i$  is therefore defined as :

$$\Phi_{i,t} \equiv (1 - \sum_{j \neq i} L_{j,t})U_t + \sum_{j \neq i} L_{j,t}W_{j,t}, i \neq j \tag{2.10}$$

In case of failure, the labour demand in firm  $i$  is equal to 0 and therefore, the only options for the worker are to find a job in another firm (and be hired with probability  $L_{j,t}$ ) or stay unemployed. In the centralised case, the fallback position is  $U_t$ .

The rents of the union are consequently defined as follows :



$$\begin{aligned}
UR_{i,t} &= \Omega_{i,t} - \Phi_{i,t}, \\
&\Leftrightarrow \\
UR_{i,t} &= L_{i,t}(W_{i,t} - A_{i,t}) = L_{i,t}((W_{i,t} - U_t) - \sum_{j \neq i} L_{j,t}(W_{j,t} - U_t)).
\end{aligned} \tag{2.11}$$

Expression (2.11) shows that the unions care about employment in the firm they represent and about the relative welfare of a worker in firm  $i$ . The latter depends on the value of working in the given firm and on the alternatives (working in another firm or being unemployed).

In the centralised case, the union rents can be expressed as:

$$UR_{i,t} = L_{i,t}(W_{i,t} - U_t). \tag{2.12}$$

This expression results from the absence of alternatives other than unemployment both in case of non-employment in firm  $i$  and of bargaining failure.

By substituting for  $W_{i,t}$ ,  $W_{j,t}$ , and  $U_t$ , we get :

$$W_{i,t} - U_t = w_{i,t}(1 + qf) - b, \forall i. \tag{2.13}$$

The difference between the value of working in firm  $i$  and being unemployed corresponds to the difference in the present monetary gains associated with these two events. The terms valuing the future are indeed equal in both situations since all the members of the labour force (employed and unemployed) end up in the same pool at the beginning of the next period. Labour market histories do not matter for the future.

We finally need to define the rents of the firm. We assume that in case of bargaining failure, there is no production and nobody is hired. However, the firm still expects a profit in the future. The rents of the firm are equal to :

$$FR_{i,t} = P_{i,t}F(Y_{i,t}) - w_{i,t}(1 + t + f)L_{i,t} \tag{2.14}$$

We assume Nash bargaining :

$$\max_{w_{i,t}} B = \max_{w_{i,t}} (UR_{i,t})^b (FR_{i,t})^{1-b}, \tag{2.15}$$

where  $b$  is the respective bargaining power of the union in firm  $i$ .

We can directly plug the expressions for the union rents and the firm rents in the Nash bargaining<sup>7</sup> to find the following expression for the wage in firm  $i$  :

$$w_{i,t} = \left( \frac{bm}{1-m} + 1 \right) \left( \sum_{j \neq i} L_{j,t} w_{j,t} - (1 - \sum_{j \neq i} L_{j,t}) \frac{b}{1+qf} \right) \tag{2.16}$$

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<sup>7</sup> See appendix 1

This immediately shows that the wage in firm  $i$  is set as a mark-up on the alternative incomes (wage in the other firm and unemployment benefit). It is also clear that this mark up depends on institutional parameters.

We derive the general equilibrium wage level by using the symmetry condition

$$w_{i,t} = w_{j,t} = w_t^* \text{ and } L_{i,t} = L_{j,t} = \frac{L_t^*}{n}^8, \text{ for all } i, j:$$

$$w_t^* = \left( 1 + \frac{\left( \frac{bm}{1-m} \right)}{1 - \frac{L_t^*(n-1)}{n} \left( \frac{bm}{1-m} + 1 \right)} \right) \frac{b}{1+qf} \quad (2.17)$$

In the centralised case ( $n=1$ ), the equilibrium wage is simply:

$$w_t^*|_{n=1} = \left( \frac{bm}{1-m} + 1 \right) \frac{b}{1+qf}. \quad (2.18)$$

Wage bargaining and labour demand functions determine the equilibrium of the economy  $(w_t^*, L_t^*)$ . In figure 1, we represent them in a two-dimension space  $(L_t, w_t)$ .

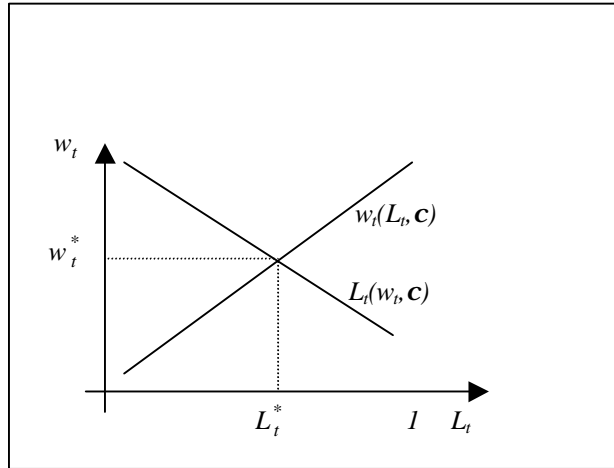


Figure 1: Equilibrium

Ultimately, equilibrium wage and employment are exclusively determined by (institutional) parameters ( $c$ ).

Hence, the equilibrium employment in a centralised economy is:

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<sup>8</sup> See appendix I.

$$L_t^*|_{n=1} = \left( \frac{1-m}{\left( b \frac{1-m}{m} + 1 \right) \frac{b(1+t+f)}{1+qf}} \right)^{\frac{1}{m}} \quad (2.19)$$

$\forall n$ , the following holds  $\frac{\partial L_t^*}{\partial b} < 0$ ,  $\frac{\partial L_t^*}{\partial m} < 0$ ,  $\frac{\partial L_t^*}{\partial t} < 0$ ,  $\frac{\partial L_t^*}{\partial b} < 0$ , and for  $n > 1$ ,

$\frac{\partial L_t^*}{\partial n} < 0$ . The effect of a firing cost is ambiguous.

Equation 2.19 shows that employment is depressed by the union bargaining power, by the effective degree of monopoly power, by the labour tax rate and by the unemployment benefit. The effect of the firing costs is ambiguous.

The union bargaining power, the number of unions, the degree of product monopoly power, the unemployment benefit and the firing costs act directly on the bargaining position of the worker. The higher the first four parameters and the lower the last one the most favourable is the bargaining position of the worker. It is pretty obvious for the bargaining power itself. For the rest, the number of unions and the unemployment benefit influence the bargaining position by defining the alternative to work, and the degree of product monopoly power by determining the surplus to be shared.

The labour tax rate, the firing cost and the degree of monopoly power also reduce labour demand, for reasons already mentioned before.

Let us remark that the degree of monopoly power acts on both sides (labour demand and bargaining position) and is pushing the unemployment rate upwards by these two mechanisms: pushing the wages up and reducing the labour demand for any wage. On the other hand, the firing costs, also acting on both sides of the market, activate two mechanisms in opposite directions. They are a form of substitute to wage compensation and therefore push the equilibrium wage downwards, but they also constitute a cost for the firm and reduce the labour demand. The total effect is therefore ambiguous.

This framework is designed to feature multiple bargaining systems. *Ceteris paribus*, firm-level bargaining ( $n$  large,  $\mathbf{h} = 0$ ) is associated with a higher level of employment than industry-level bargaining ( $n$  large,  $\mathbf{h} \rightarrow 1$ ). Centralised bargaining ( $n = 1$ ) always leads to relatively low wages.

## 2.2. Complementarities

We have already described the expected effects of institutional reforms. Equation (2.19) implies that the influence of one particular parameter on the equilibrium level of the economy depends crucially on the rest of the institutional framework. The point is that any parameter depressing the level of employment also depresses the adjustment of employment to an institutional reform. For example, the effectiveness of a tax reform might be moderated by strong unions or a generous unemployment benefit system.

Institutions *interact* with each other, i.e. their effect on the equilibrium employment rate depend on each other. Two institutions are *complementary* when in a particular institutional framework, the effect of one of them is reinforced by the other.

We can distinguish three types of parameters. First, there are parameters indicating exclusively the bargaining position of the workers:  $n$ ,  $b$ ,  $b$ . The lower they are, the lower is the equilibrium wage and the larger labour demand. By pushing the wage up, they reduce the labour demand and reduce its sensibility to institutional reforms. Second, there is the tax rate that affects directly labour demand. Taxes also introduce a cost in adjusting the labour demand to wages. The higher these taxes, the smaller labour demand's response to the wage. Hence, for a reform to be effective, low taxes are better. Finally, there are parameters affecting labour demand and the bargaining position of the union: the firing costs ( $f$ ) and the degree of monopoly power ( $m$ ). Firing costs reduce labour demand (and so its response to the wage changes) but also push the wage downwards (sort of substitution with wage). So the total effect on employment is ambiguous. Firing costs also interact ambiguously with the rest of the institutions. When considered as a factor affecting the bargaining position, its effect is larger the larger the other parameters. When considered as a factor reducing the labour demand, the lower the other parameters, the larger the negative effect of the firing costs. So there is an obvious ambiguous effect with respect to the firing costs.

The degree of monopoly power determines the bargaining position of the worker in a positive way. It therefore also reduces labour demand's response to the wage. However the degree of monopoly power also reduces labour demand (and its response). So its effects are larger the smaller the parameters of the first group and the lower the taxes.

Since institutional frameworks vary strongly across countries, similar institutional reforms will have very different effects on the unemployment rate. Some reforms are implemented not only because of their direct favourable effect on the unemployment rate but also because of their interaction with other future reforms, whose effectiveness would then be enhanced.

Therefore, we conclude that the clever design of a labour market reform could lie in the exploitation of these complementarities.

### 3. INSTITUTIONS AND LABOUR MARKETS IN OECD COUNTRIES

In our theoretical model, we use a number of variables to reflect the institutional framework. In this section, we describe what indicators we use to represent the institutions in our empirical analysis. We also present some stylised facts of the labour markets in OECD countries and relate them in a qualitative way to institutions and their evolution over time.

The theoretical model suggests that the unemployment rate depends on various institutional parameters, which we proxy by variables<sup>9</sup> in the following way. Union bargaining power is proxied by union density, monopoly power and degree

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<sup>9</sup> Details on these indicators are presented in appendix 2

of centralisation by indicators on the degree of co-ordination between the bargaining actors and the degree of centralisation (or union coverage) of the economy (privileged level of bargaining: firm, industry or national). As an indicator for labour taxes, we use the sum of the direct tax rate and the employment tax rate, measuring the fiscal pressure respectively on workers and employers.

The generosity of the unemployment benefit system is proxied by a summary indicator of the replacement rate, averaging the replacement rates in various time, family and working conditions.

Firing costs are proxied by three types of employment protection indicators: protection of open-ended contracts, restrictions on the use of fixed-term contracts and restrictions on the use of temporary work agencies. We have built these three indexes by a method described in the appendix 3, consisting in grading regulations in the field of working contracts.

We introduce the change in inflation as the driving macroeconomic variable (cfr. Nickell, 1998), so as to explain deviations of the unemployment rate from its natural non-accelerating level.

We now turn to the description of the evolution of labour markets in OECD countries and their relation with institutions. When we look at the evolution of unemployment rates over time in OECD countries (Table 1), we distinguish three groups<sup>10</sup>. The first group (successful) is the one of countries succeeding in reducing the unemployment rate, after having experienced a significant increase. These are Australia, Denmark, Ireland, The Netherlands, New Zealand and United-Kingdom. We also note that the dates of success vary across countries. The success of Australia, Denmark and New Zealand is recent, while Ireland, The Netherlands and United Kingdom are showing signs of increasing performance since more than a decade. The second group (unsuccessful) we distinguish is the one still on a path of increasing unemployment rates: Belgium, Finland, France, Germany, Italy, Sweden and Switzerland. The increases in unemployment rates are not occurring simultaneously. The Scandinavian countries are concerned by a significant change only in the late eighties, beginning nineties, so as Switzerland. The unemployment rate is on the other hand continuously increasing since the beginning of the seventies in countries such as Belgium, France, Germany and Italy, the group of “continental” European countries. Our third group (stable) consists of countries that stabilised their unemployment rate after having experienced a significant increase (Canada and Norway) or countries that never experienced any big significant disturbance on its labour market: Austria, Japan and USA. The standard deviation of their unemployment rate is indeed very small.

Now, let's turn to the institutions as potential determinants of the recent developments. What we want to know is if there is any relationship between institutions and the development of the unemployment rates. In this respect, differences between countries may be caused by time invariant differences in institutions or by the differences in the evolution of institutions.

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<sup>10</sup> Elmeskov, Martin and Scarpetta (1998) propose a similar distinction.

We look at the important dates in each country, i.e. dates showing important changes in the labour market. For all the groups, we start with year 1960 and finish with year 1996. For all countries with rising unemployment, we point out the year where the unemployment rate significantly increased. For the successful countries, we point in addition the year when the unemployment rate was the highest. For countries with a stable unemployment rate, we choose arbitrarily the year 1985 as additional reference.

First of all, it is interesting to look at cross-sectional differences in institutional frameworks, comparing the averages of indicators for different institutions (Table 2). At first sight, the grouping of countries does not correspond clearly to a grouping of institutions. There is apparently no straight link between institutions and unemployment at the level of the four groups of countries. Still, we can sketch out some interesting patterns.

The group of “unsuccessful countries” is characterised by a relatively high tax burden, Switzerland being the only exception. The other three groups have a relatively low tax burden, with the exception of The Netherlands and Austria. What is surprising is that the countries that managed to reduce their unemployment rates over the last decade are also having relatively high replacement rates on average, the only exception being Australia. Further, we see clearly that the group of unsuccessful countries has relatively high labour standards (existence of a minimum wage and employment regulation). Concerning the employment regulation indicator, it is also remarkable to see that all successful countries, without exception, have a more flexible employment regulation than the other countries. The group of unsuccessful countries is dominated by a medium level of centralisation and co-ordination, Finland and Sweden being important exceptions. Some countries with a medium degree of centralisation appear to be better performing, but they all present a relatively high degree of co-ordination. Furthermore, most of the non-successful countries have a relatively high union coverage. Some high-union-coverage-countries are in the other groups but we note that in these cases, the union density is also high, while in the unsuccessful groups, three countries (Italy, France, Germany) present huge differences between the union density and the union coverage. Finally, it appears that the unsuccessful group is relatively more open than the rest.

This descriptive information on cross-sectional differences between institutions does not tell the whole story. However, it is still interesting to see that there are some common features among the countries experiencing the same evolution, even though the evolution we consider relates to the last decade, while the features relate to the last forty years.

Averages of institutional indicators can however be misleading because they do not tell anything about the evolution of institutions. That’s why we look at the institutions at crucial turning points in the evolution of the unemployment rates of the 18 OECD countries (Tables 3, 4 and 5).

Let us first look at the group of unsuccessful countries. It seems that the increase in unemployment rate is associated with an increase in tax burden, employment protection of open-ended contracts, union coverage and union density, Switzerland being an exception for the two latter. Most of the countries engaged in a process of reforming the regulation of fixed term contracts in a more flexible

way, but this was combined with a reinforcement of the protection of traditional open-ended contracts. Finland and Sweden, the two Scandinavian countries of the group were centralised at the beginning of the sixties. Their centralisation level has decreased over time. Now, they both conclude more agreements on the industry level. We also see that Sweden has experienced an additional drop in its co-ordination level.

Regarding the group of successful countries, most of them experienced a reduction in their tax burden at the crucial point starting from where their unemployment rates went down. Not much happened in the employment regulation, except that the protection of open-ended contracts was reduced in the Netherlands, while United Kingdom is the only country reinforcing it in its successful period. When considering the changes occurred in the “successful period” only, i.e. between the year of the highest unemployment rate and today, we see that most of the countries have changed many institutions at once, combining a reduction in tax burden, replacement rate, union density and union coverage. Australia, The Netherlands, New Zealand and United Kingdom also reformed their bargaining system, although in different ways: Australia, towards a low centralised and a weakly co-ordinated system, the Netherlands towards increased co-ordination between unions and employers’ organisations (cfr. Agreement of “Wassenaar”), New Zealand switched from an industry-level bargaining system to a firm-level system, so did United Kingdom. The Netherlands and United Kingdom changed in addition their labour standards, the Netherlands by relaxing its employment protection regulation in all respects (open-ended contracts, fixed term contracts and temporary work agencies), while United Kingdom suppressed the minimum wage in 1993. These two countries are the most obvious examples of “comprehensive” reforms implemented in their labour markets.

When we look at the two countries that experienced an increase in their unemployment rate, that then stabilised (Canada and Norway) went through opposite changes in union density (went up) and union coverage (went down). Norway reduced slightly the tax burden, while Canada increased both the tax burden and the replacement rate. Canada has a decentralised bargaining system, while Norway is one example of a highly centralised and co-ordinated country. Countries that did not experience important disturbances in their labour markets are Japan, USA and Austria. Union density and union coverage fell in all countries, except for Austria (union density was the only one falling). They didn’t experience any change in their wage bargaining system, Japan and USA staying decentralised and Austria negotiating mainly at the industry-level. The increases in the tax burden were also proportionally much larger before 1985 than after.

In conclusion, this descriptive approach of the institutional frameworks gives us an intuition of why some countries were more successful than others were. The reductions in the tax burden and replacement rates seem to be important ingredients. Furthermore, the reduction in the union bargaining power is present in most of the successful countries, combined with a deeper reform of the entire bargaining system. We also see that most of the successful countries changed a lot in the same time, the two most obvious examples being The Netherlands and

United Kingdom. The theoretical ideas seem to be supported by the stylised facts. In the econometric study below, we investigate more closely the mechanisms through which success and failure happened.

## **4. EMPIRICAL STUDY**

### **4.1. Previous work**

Nickell (1998) constitutes a starting point to our empirical study. He considers 20 OECD countries taking averages over two time periods : 1983-8 and 1989-94. From his analysis, he concludes that determinants of the unemployed treatment such as the replacement rate and benefit duration increase unemployment. Active labour market policies can to a certain extent counteract this effect. Owner occupation rates affect unemployment and characteristics of the wage determination system also play a significant role. Union density and union coverage are pushing the unemployment rate upwards. On the other hand, co-ordination between unions and employers stimulate labour market performance. Finally, labour taxes increase total unemployment, while none of the indicators of labour market rigidity (employment protection regulation, labour taxes) has a significant effect.

Scarpetta (1996) considers 15 to 17 OECD countries over the 1983-1993 period. The explanatory variable is the OECD structural unemployment rate. The main conclusion is that institutions matter and play an important role in the persistence of unemployment. In a dynamic formulation of the model Scarpetta adds variables such as the terms of trade, assumed to play an important role in small open economies. For the rest, the variables taken into consideration are quite similar to the ones used by Nickell. Scarpetta finds different results however, with respect to labour taxes (no significant effect) and the employment protection regulation (significant positive effect). The latter result also contrasts with Bertola (1992) who was also unable to find any relationship between unemployment levels and employment adjustment costs. Further, Scarpetta finds support for the hump-shape hypothesis associated with the degree of centralisation (Calmfors and Driffill, 1988). Interest rates and terms of trade do not have any significant effect on long run labour market conditions. Regarding the role of institutions on the persistence of unemployment, Scarpetta finds that generous unemployment benefits, employment protection and high degree of unionisation reduce the adjustment period. On the other hand, highly centralised or decentralised economies are characterised by faster adjustments. This confirms the hump-shape hypothesis.

Elmeskov, Martin and Scarpetta (1998) extend the previous analysis by considering a larger number of countries, taking the recent institutional developments into account (in particular, evolutions of collective bargaining structures and employment protection legislation) and testing the existence of potential interactions between policies or institutional factors. The main conclusion is that successful countries might owe their success to reforms directed



at insiders. In particular, the tightening of eligibility conditions and the reduction of unemployment benefits, as well as the easing up of fixed term contracts regulation might have had a determinant influence. The authors build a new indicator characterising the wage setting system, summarising the degree of centralisation and the degree of co-ordination. Assuming that in countries where the degree of centralisation is medium (negotiations mainly at the industry level), co-ordination among actors might be particularly crucial, they upgrade countries with medium level of centralisation and high degree of co-ordination. Elmeskov et al. also find empirical support for the interaction effects hypothesis. First, the average tax wedge and the employment protection regulation push the structural unemployment rate at a higher level in countries with intermediary level of corporatism. Further, unemployment benefits are likely to have a higher effect in countries with relatively high levels of active labour market policy expenditures. And it appears that the degree of employment protection does not matter for the effect of unemployment benefits, while they would have expected the effect of unemployment benefit to be higher in countries with high employment protection, the bargaining power of the workers assumed to be bigger.

Finally, Daveri and Tabellini (1997) look at complementarities between labour taxes and the nature of collective arrangements. Their analysis concerns 14 countries over the period 1965-1991. They find empirical support for a correlation between the negative effect of labour taxes on labour market performances and the nature of organisation of the workers. Decentralised or centralised countries are performing better, in the sense of lower unemployment rate, irrespective of the level of labour taxes.

Nickell and Van Ours (2000) use the results from Scarpetta (1996), Elmeskov et al. (1998) and Nickell and Layard (1999) to indicate the quantitative impact of institutional changes on the equilibrium unemployment rates in the Netherlands and the UK. They conclude that much of the recent decline in equilibrium unemployment in both countries is due to a combination of changes in the wage bargaining structures, the tax benefit system and active labour market policies.

## **4.2. Methods and assumptions**

Our empirical study is based on annual data (1960-1995) for eighteen OECD countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, New Zealand, Sweden, Switzerland, United Kingdom and United States of America).

The conclusion drawn in the theory section is that unemployment rate is influenced by a set of institutional variables. The effect of each institution is depending on the institutional framework as a whole. Since institutional frameworks differ across countries and time, we cannot expect each particular institution to have an identical effect over time and across countries. In technical terms, that means that coefficient estimates coming from a linear regression on a set of institutional regressors, considered separately, are probably not be

homogenous across countries and constant over time<sup>11</sup>. So we can partly take the heterogeneity between coefficients measuring the impact of various institutions into account by explicitly setting that it depends on the other institutions. Including complementarity coefficients can therefore be seen as an attempt to solve the heterogeneity problem.

Concretely, we regress the standardised unemployment rate  $u_{i,t}$  on a  $K$  of institutional variables denoted  $\mathbf{c}_{k,i,t}$  and the change in inflation denoted by  $\Delta^2 p_{i,t}$ .

We estimate the following model :

$$u_{i,t} = \mathbf{a}_i + bD^2 p_{i,t} + \sum_{k=1}^K \mathbf{g}_{ik} \mathbf{c}_{k,i,t} + \sum_{k=1 \leq l \leq K}^K \mathbf{g}_{ikl} (\mathbf{c}_{k,i,t} - \mathbf{c}_{k..})(\mathbf{c}_{l,i,t} - \mathbf{c}_{l..}) + \mathbf{e}_{i,t}, \quad (4.1)$$

$$u_{i,t} = \mathbf{a}_i + bD^2 p_{i,t} + \sum_{k=1}^K \mathbf{g}_k \mathbf{c}_{k,i,t} + \sum_{k=1 \leq l \leq K}^K \mathbf{g}_{kl} (\mathbf{c}_{k,i,t} - \mathbf{c}_{k..})(\mathbf{c}_{l,i,t} - \mathbf{c}_{l..}) + \sum_{k=1}^K \mathbf{h}_k \mathbf{c}_k + \left( \sum_{k=1 \leq l \leq K}^K \mathbf{h}_{2kl} (\mathbf{c}_{k,i,t} - \mathbf{c}_{k..})(\mathbf{c}_{l,i,t} - \mathbf{c}_{l..}) + \mathbf{e}_{i,t} \right) \quad (4.2)$$

with

$$\mathbf{g}_{ik} = \mathbf{g}_k + \mathbf{h}_{1k}, \quad (4.3)$$

$$\mathbf{g}_{ikl} = \mathbf{g}_{kl} + \mathbf{h}_{2kl}, \quad (4.4)$$

$$\mathbf{c}_{k..} = \frac{1}{NT} \sum_{i=1}^N \sum_{t=1}^T \mathbf{c}_{k,i,t}, \quad (4.5)$$

where we allow individual effects ( $\mathbf{a}_i$ ) so as to take care of the unobserved heterogeneity.  $\mathbf{c}_k$  and  $\mathbf{c}_l$  being institutional parameters and  $\mathbf{e}_{i,t}$  is an error term.

For the “traditional” component of the error term, we assume the following:  $Eu_{it} = 0, \forall i, t$ ,

We also allow for country-specific coefficients, but we assume, as Swamy (1970) that these coefficients are random draws from the following (common to all countries) distribution, so that

$$E(\mathbf{g}_{ik} - \mathbf{g}_k)(\mathbf{g}_{ik} - \mathbf{g}_k)' = \begin{cases} \Delta & \text{if } i = j, \\ 0 & \text{if } i \neq j, \end{cases} \quad (4.6)$$

$$E(\mathbf{g}_{ikl} - \mathbf{g}_{kl})(\mathbf{g}_{ikl} - \mathbf{g}_{kl})' = \begin{cases} \Lambda & \text{if } i = j, \\ 0 & \text{if } i \neq j, \end{cases} \quad (4.7)$$

$$\mathbf{g}_{ik} \text{ and } \mathbf{e}_{jt} \text{ are independent, } \forall i, j, k, \quad (4.8)$$

$$\mathbf{g}_{ikl} \text{ and } \mathbf{e}_{jt} \text{ are independent, } \forall i, j, k, l, \quad (4.9)$$

$$\mathbf{g}_{ik} \text{ and } \mathbf{g}_{jk} \text{ are independent, for } i \neq j, \forall k, \quad (4.10)$$

$$\mathbf{g}_{ikk} \text{ and } \mathbf{g}_{jkl} \text{ are independent, for } i \neq j, k \neq l, \quad (4.11)$$

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<sup>11</sup> We test formally for homogeneity with two alternative tests : the traditional Fisher Test and the Bayesian Leamer (1978) Test.

$$E\mathbf{e}_{it}\mathbf{e}_{jt} = \begin{cases} \mathbf{s}_i^2 & \text{if } i = j, \\ 0 & \text{if } i \neq j, \end{cases} \quad (4.12)$$

$$E\mathbf{e}_{it}x_{jt} = 0, \forall i, j, t. \quad (4.13)$$

Regarding the unobserved heterogeneity parameter  $\mathbf{a}_i$ , we can treat it as fixed or as random. In the latter case, we will assume that:

$$E\mathbf{a}_i\mathbf{e}_{it} = 0, \quad (4.15)$$

$$E\mathbf{a}_i\mathbf{a}_j = \begin{cases} \mathbf{s}_a^2 & \text{if } i = j, \\ 0 & \text{if } i \neq j, \end{cases} \quad (4.16)$$

$$E\mathbf{a}_i\mathbf{b}_{jkl} = 0, \forall i, j, k, l \quad (4.17)$$

$$E\mathbf{a}_i\mathbf{b}_{jk} = 0, \forall i, j, k \quad (4.18)$$

We have facilitated the interpretation of the complementarity coefficients by transforming the institutional variables in their deviations from the pooled cross-section mean. Thanks to that formulation we can interpret the first coefficient as the effect of a particular institutional parameter when the other parameters considered in the complementarity variables are at their mean values. This interpretation facilitates the discussion the results.

### 4.3. Estimation results

Regression results are summarised in Table 6. We run both between and within regressions, and the main conclusion is that between estimates are overall not significant, while we get some interesting indications from the within-estimates. The alternative Leamer Test (1978) even enables us to accept most of the time the null hypothesis of coefficient homogeneity between countries. To investigate the sensitivity of our estimation results, we run regressions including successively complementarities with a particular institution.

In column (1), we consider a model with institutions treated *independently*. Both tests (Fisher and Leamer) reject the null hypothesis of coefficient homogeneity. This confirms our intuition that interactions between institutions should be considered. Indeed, coefficient homogeneity is not rejected with a Leamer test when running a regression including all complementarity variables (column 8).

In column (2), we present within-estimates including complementarity variables related to the tax rate. It seems that, at the average levels of the replacement rate, the degree of strictness in the employment regulation, the union coverage and the degree of co-ordination, the tax rate has a positive significant effect. If on the other hand these latter variables are different from their mean levels, additional interaction effects appear. Hence, a relatively strict employment regulation more than counteracts the positive effect of the tax rate. In theory, the interaction effects of employment regulation (firing costs) with respect to the other parameters was ambiguous. Empirically, it seems that the effect on the bargaining

power of the worker (where the firing cost acts as a substitute for wage compensation) dominates the effect on the labour demand (where the firing cost was acting as a production cost). Furthermore, high union co-ordination and high union coverage have complementary effects to the tax rate. Both variables proxy the number of unions  $n$  in the theoretical model. The higher they are, the lower would be the number of unions in our model (high degree of centralisation). We therefore observe what we theoretically expected, i.e. a low number of unions increase the positive effect of the tax rate. It also means that reforms aimed at increasing the co-ordination and the union coverage would enhance the effectiveness of a tax reform. Finally, we observe a significant positive interaction between the replacement rate and the tax rate. This is opposite to what we would expect in theory. The reason for a positive interaction between the replacement rate and the tax rate probably lies in other mechanisms. The introduction of a social security budget constraint would maybe be enlightening. A reduction in the replacement rate would then be coupled to a reduction in the tax rate and that would be the way they reinforce each other.

In column (3), we consider complementarities with respect to the replacement rate. As for the tax rate, we can draw the same kind of interpretation for the independent coefficient. Employment regulation (firing costs) is also reducing the effect of the tax rate. A high co-ordination (low  $n$ ) reinforces the effect of the replacement rate, as expected by the theory.

In column (4), we study complementarities with respect to the employment regulation. We suggested already that the (negative) effect of the firing cost on the bargaining position of the worker was dominating the one on the labour demand. Indeed, we observe that the effect of employment regulation when all the other parameters are at their mean levels is significantly negative. Furthermore, this negative effect is enhanced by high taxes and counteracted by a high union coverage. We indeed expected in theory that in the case where the effect on the bargaining position would be dominating, the effect of employment protection would be larger when the other parameters are high (here namely high  $n$  implies low union coverage), which appears to be completely confirmed by our estimations.

In column (5), we regard complementarities related to an indicator of the union bargaining power, the union density. Union density has a positive significant effect when all the other institutional variables are at their mean levels.

Again, we find that the effect of one parameter reinforcing the bargaining position of the worker is harmed by the presence of other institutions. Hence a high level of taxes reduces the positive effect of union density. A strict employment protection harms the bargaining position of the worker and therefore reinforces the marginal effect of union density. These two interactions correspond to the theory. Furthermore, a high level of co-ordination also reduces the positive effect of union density. This is also confirming the theory since we expected that a low number of unions (here proxied by a high level of co-ordination) would reduce the effect of union bargaining power (here proxied by union density).

In column (6), we present the estimations including complementarity variables relative to the union coverage. High union coverage reduces the unemployment rate when the other parameters are at their mean levels. In addition to the

complementarities already discussed, we find that the marginal effect of union coverage is increased by co-ordination.

In column (7), we consider complementarities related to the level of co-ordination between the bargaining actors. The independent effect of co-ordination is not significant. Complementarity variables offer however new insights. Coordination would indeed have a negative effect when taxes and union density are relatively high, i.e. when the worker's bargaining position is quite good. This situation would also correspond to the point where coordination actually makes sense.

Finally, in column (8), we present a regression with all complementarity variables included. The conclusions drawn in the previous paragraphs are hardly affected. To evaluate the predictive power of our model including all complementarity variables, we compare its average performance with the one of a model including independent variables only. The average performance is simply the average of the discrepancies between predicted change and actual change, in absolute terms. Results are presented in Table 7. We find that the model including all complementarity variables perform much better on average than the one excluding them. The average absolute error is 1.8 percentage points for the former and 2.4 percentage points for the latter<sup>12</sup>.

In conclusion, we find evidence of interesting complementarities between variables. Parameters affecting the bargaining position of the worker like low union coverage, high replacement rates, low co-ordination, high union density and flexible employment protection reduce the effectiveness of reforms. Furthermore, taxes also seem to reduce the effectiveness of numerous reforms, except for the replacement rate. The explanation could lie in the existence of a direct relationship between them (like via a social security budget constraint). Finally, we found that the employment protection was more acting as a substitute for wage compensation than as a cost falling on labour demand.

#### 4.4. Simulations

In this section, we focus on the recent evolution of OECD countries, i.e. the part on what we based our classification of countries into three groups, successful, unsuccessful and stable. Our objective is twofold. First, we test the explanatory power of our model including all complementary variables (column (8)) versus a model including only independent variables (column (1)). Second, we investigate the sources of success and failure in unemployment histories. Two elements play a key role in the evolution of unemployment. First, the initial institutional setting determines the effect of the policies and reforms that are implemented. Second, the policies and reforms implemented interact with each other. In the analysis below, we propose therefore a distinction between "initiation situation" and "policy interaction" effects.

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<sup>12</sup> From a rank correlation test it appears that there is a significant correlation between the predictions from the model in column (8) of Table 6 and the changes in actual unemployment rates. There is no significant correlation between the predictions from the model in column (1) of Table 6 and the changes in actual unemployment rates.

We now turn to the unemployment histories. The empirical analysis includes six institutional parameters: labour tax rate, replacement rate, degree of employment protection, union density, union coverage index and co-ordination index. We consider two points (smoothed) in time: T and T+1. The estimated unemployment rates in these two points are:

$$u_{T+1} = \hat{a}_i + \hat{b}_i D^2 p_{i,T+1} + \sum_{k=1}^6 \hat{g}_{ik} c_{k,i,T+1} + \sum_{k=1}^6 \sum_{l \leq k} \hat{g}_{kl} (c_{k,i,T+1} - c_{k..}) (c_{l,i,T} - c_{l..}), \quad (4.19)$$

$$u_T = \hat{a}_i + \hat{b}_i D^2 p_{i,T} + \sum_{k=1}^6 \hat{g}_{ik} c_{k,i,T} + \sum_{k=1}^6 \sum_{l \leq k} \hat{g}_{kl} (c_{k,i,T} - c_{k..}) (c_{l,i,T} - c_{l..}), \quad (4.20)$$

and consequently, the predicted change in unemployment rate is:

$$u_T = \hat{b}_i (D^2 p_{i,T+1} - D^2 p_{i,T}) + \sum_{k=1}^6 \hat{g}_{ik} D c_{i,l,T+1} + \sum_{k=1}^6 \sum_{l \leq k} \hat{g}_{kl} [\Delta c_{k,i,T+1} (c_{l,i,T} - c_{l..}) + \Delta c_{l,i,T+1} (c_{k,i,T} - c_{k..}) + \Delta c_{kl,i,T+1} \Delta c_{l,i,T+1}]. \quad (4.21)$$

The evolution of the unemployment rate is decomposed in three parts (4.21). The first part measures the effect of the acceleration in inflation. The second part measures the direct effects of changes in institutional parameters, i.e. the predicted effect of a change in an institutional parameter when the rest of the institutional framework is at the overall mean level. The third and last part measures the interaction effects. The latter can also be decomposed in two elements. The first element translates the effect of the “initial condition”, i.e. the additional effect coming from the fact that the institutions of the country are not at the overall mean level. The second element reflects policy interactions, i.e. the effect coming from the particular combination of reforms implemented during the period considered. We detail in Table 8 the results of our predictions.

A first striking element is the heterogeneity in stories. The first group of countries was unsuccessful for various reasons. Some countries like Belgium and Switzerland implemented damaging policies. In Belgium, the poor labour market performance is mainly due to the increase in the labour tax rate together with the rise in union density. Switzerland also suffered from the increase in the labour tax rate, especially since it was combined with a reinforcement of the replacement rate. Furthermore, its union coverage went down. All these three factors comforted the worker’s bargaining position and pushed the unemployment rate up.

Germany, Italy and Sweden rather suffered from the negative interactions between the policies implemented and the initial institutional setting. The German institutional setting was such that the bargaining position of the workers was strong, so that the reforms were less effective. Swedish institutional setting, on the other hand, was “favourable”, in the sense that the bargaining position of the worker was weak, but the reforms were wrong, i.e. their direct effect pushed the unemployment rate upwards. The Italian situation was somewhere in between the German and the Swedish ones.

France, and to a smaller extent Italy, owe their failure to the combinations of policies implemented during the period considered. The combination of reforms lead in France lead to an estimated increase of 4.21 percentage points in the unemployment rate. The increases in both the tax rate and the replacement rate and the fall in the employment protection moderated strongly the effects of the fall in union density and the increase in union coverage.

Among the successful countries, the Netherlands and Ireland obviously implemented the “good” reforms. The direct effect of these reforms is the main part of the story but they also designed their reforms well, given their initial institutional settings. The evolution in United Kingdom is harder to understand, since the reforms implemented were not exploiting institutional complementarities.

Among the stable countries, we find Canada, Japan and United States which somehow benefited from their institutional setting to moderate the damaging effects of the policies implemented. Austria, on the other hand, couldn’t benefit from the reforms implemented (that had a direct negative effect) because of the strong bargaining position of the worker.

In conclusion, these simulations show how the unemployment histories can diverge. Two elements seem crucial. First, the nature of the reforms implemented and second, the way it is amplified or moderated by the rest of the institutional framework. The ideal reform combines a negative direct effect and the exploitation of complementarities in the institutional framework. Some countries, where the bargaining position of the worker is quite strong will probably have to do more efforts to reach the success than some others, benefiting from a favourable institutional framework.

## 5. CONCLUSION

There is an obvious difference in labour market performance between OECD countries in particular in terms of the evolution of unemployment rates. For some countries apart from cyclical fluctuations unemployment rates have been rather constant in the past decades. However, most of the countries have experienced a rapid increase in unemployment rates in the beginning of the 1980s. Some of these countries have had a high unemployment rate since, but other countries have managed to bring unemployment rates down substantially. The main question we address in this paper is to what extent labour market reforms have been an important determinant of the evolution in unemployment rates. We are especially interested in the question whether particular combinations of labour market reforms were more successful than others. We investigate the relationship between unemployment rate and labour market institutions such as tax rate, replacement rate, employment protection, union density, union coverage, co-ordination in bargaining. Since we are interested in potential complementarities in institutions and institutional changes we investigate both the direct effects of institutions and interactions between them. Our empirical analysis shows that indeed interaction effects are important. If for example labour taxes are reduced this has a larger negative effect on unemployment if the replacement rate, union

coverage and coordination in bargaining is high and if union density and employment protection is low. Lowering the replacement rate is more effective if the tax rate and union density are higher and union coverage is lower.

Our main conclusion is twofold. First, for most countries interaction effects enforce direct effects and for some countries interaction effects are more important than direct effects. Second, for most countries it is the effect of financial incentives (tax rate and replacement rate) that is driving the direction in which the unemployment rate moves. If financial incentives have been enforced unemployment was lowered, if financial incentives have been weakened unemployment deteriorated. All in all, we conclude that there is a clear relationship between unemployment and particular combinations of labour market reforms.

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**Table 1: *Standardised unemployment rates in OECD countries***

	1960	1970	1980	1985	1990	1993	1996	Mean	Stdev
BEL	3.3	1.9	8.1	12.6	8.9	8.9	9.7	6.9	4.1
CHE	0.0	0.1	0.2	0.9	0.5	3.8	3.5	1.0	1.3
DEU	1.0	0.6	3.2	8.1	6.3	7.9	9.0	4.5	3.3
FIN	1.4	1.9	4.7	5.0	3.5	17.6	16.1	6.0	4.9
FRA	1.5	2.5	6.4	10.5	9.1	11.7	12.3	6.6	4.3
ITA	6.5	5.5	7.7	10.4	11.5	10.3	12.0	8.4	2.9
SWE	1.7	1.5	2.0	2.8	1.7	9.5	10.0	3.5	2.9
AUS	1.4	1.4	5.9	7.9	7.0	11.0	8.6	5.5	3.2
DEN	2.3	0.7	6.9	7.3	8.4	10.1	6.0	5.3	3.4
GBR	1.4	2.2	5.7	11.6	5.5	10.5	8.2	5.8	3.6
IRL	5.6	5.9	7.4	17.6	13.8	15.6	11.9	9.9	4.7
NLD	1.5	1.5	6.2	11.1	7.6	6.6	6.3	5.5	3.5
NZL	0.1	0.1	2.2	4.2	7.8	9.5	6.1	3.3	3.4
AUT	2.6	1.4	1.9	3.6	3.2	4.0	4.4	2.9	1.4
CAN	6.5	5.7	7.5	10.5	8.1	11.2	9.7	7.7	2.3
JPN	1.7	1.1	2.0	2.6	2.1	2.5	3.4	2.1	0.7
NOR	1.2	0.8	1.7	2.6	5.3	6.1	4.9	2.7	1.7
USA	5.5	4.9	7.1	7.2	5.5	6.9	5.3	6.0	1.3
Mean	2.5	2.2	4.8	7.6	6.4	9.1	8.2		
Std dev	2.1	1.9	2.6	4.4	3.4	3.9	3.5		

Table 2: Averages in unemployment rates and institutions (standard errors)

	Unempl. Rate (%)	Tax Burden (%)	Repl. Rate (%)	Empl.regulation	Centralisation	Co-ordination	Union Coverage	Union Density
BEL	6.9 ( 4.1 )	46.6 ( 17.3 )	41.3 ( 3.9 )	0.7 ( 0.1 )	2.0 ( 0.0 )	2.0 ( 0.0 )	90.0 ( 0.0 )	50.7 ( 3.9 )
CHE	1.0 ( 1.3 )	31.6 ( 14.7 )	12.7 ( 9.1 )	0.1 ( 0.0 )	2.0 ( 0.0 )	2.0 ( 0.0 )	52.0 ( 1.0 )	29.1 ( 1.5 )
DEU	4.5 ( 3.3 )	45.5 ( 7.6 )	28.8 ( 1.0 )	0.7 ( 0.2 )	2.0 ( 0.0 )	3.0 ( 0.0 )	88.4 ( 3.1 )	33.0 ( 2.2 )
FIN	6.0 ( 4.9 )	51.8 ( 17.3 )	15.4 ( 8.7 )	0.7 ( 0.2 )	2.6 ( 0.5 )	2.0 ( 0.0 )	95.0 ( 0.0 )	65.0 ( 11.4 )
FRA	6.6 ( 4.3 )	43.6 ( 9.5 )	29.7 ( 6.9 )	0.6 ( 0.3 )	2.0 ( 0.0 )	2.0 ( 0.0 )	88.0 ( 4.1 )	16.5 ( 5.7 )
ITA	8.4 ( 2.9 )	46.7 ( 9.4 )	1.9 ( 1.0 )	0.8 ( 0.1 )	1.4 ( 0.8 )	2.2 ( 0.4 )	75.4 ( 9.6 )	40.2 ( 3.9 )
SWE	3.5 ( 2.9 )	53.9 ( 27.1 )	3.8 ( 3.4 )	1.0 ( 0.1 )	2.8 ( 0.4 )	2.8 ( 0.4 )	81.5 ( 6.7 )	77.4 ( 11.2 )
AUS	5.5 ( 3.2 )	16.8 ( 4.9 )	21.9 ( 4.5 )	0.1 ( 0.1 )	1.7 ( 0.5 )	1.7 ( 0.5 )	85.7 ( 5.0 )	44.8 ( 5.7 )
DEN	5.3 ( 3.4 )	30.8 ( 13.8 )	50.5 ( 16.8 )	0.3 ( 0.2 )	2.5 ( 0.5 )	3.0 ( 0.0 )	69.0 ( 0.0 )	68.5 ( 7.4 )
IRL	9.9 ( 4.7 )	16.6 ( 8.1 )	24.5 ( 5.4 )	0.1 ( 0.0 )	2.0 ( 0.0 )	2.3 ( 0.5 )	85.0 ( 0.0 )	52.8 ( 2.3 )
GBR	5.8 ( 3.6 )	29.0 ( 8.9 )	22.9 ( 3.2 )	0.2 ( 0.0 )	1.7 ( 0.5 )	1.0 ( 0.0 )	58.8 ( 8.6 )	42.1 ( 5.3 )
NLD	5.5 ( 3.5 )	48.1 ( 21.6 )	39.3 ( 14.2 )	0.4 ( 0.1 )	2.0 ( 0.0 )	2.5 ( 0.5 )	75.8 ( 2.4 )	32.5 ( 5.7 )
NZL	3.3 ( 3.4 )	10.0 ( 12.5 )	29.6 ( 2.3 )	0.3 ( 0.0 )	1.8 ( 0.4 )	1.0 ( 0.0 )	60.3 ( 13.4 )	49.5 ( 9.8 )
AUS	2.9 ( 1.4 )	42.4 ( 5.8 )	19.4 ( 11.1 )	0.4 ( 0.0 )	2.0 ( 0.0 )	3.0 ( 0.0 )	98.0 ( 0.0 )	54.1 ( 8.1 )
CAN	7.7 ( 2.3 )	25.1 ( 9.7 )	26.1 ( 2.9 )	0.1 ( 0.0 )	1.0 ( 0.0 )	1.0 ( 0.0 )	34.9 ( 2.5 )	33.8 ( 3.4 )
JPN	2.1 ( 0.7 )	20.2 ( 8.7 )	10.8 ( 1.5 )	0.6 ( 0.1 )	1.0 ( 0.0 )	3.0 ( 0.0 )	27.2 ( 4.3 )	30.3 ( 4.6 )
NOR	2.7 ( 1.7 )	32.4 ( 19.7 )	20.3 ( 15.9 )	0.6 ( 0.2 )	3.0 ( 0.0 )	3.0 ( 0.0 )	71.3 ( 4.1 )	56.4 ( 1.3 )
USA	6.0 ( 1.3 )	29.1 ( 13.1 )	11.5 ( 2.0 )	0.0 ( 0.0 )	1.0 ( 0.0 )	1.0 ( 0.0 )	24.7 ( 5.3 )	21.1 ( 4.1 )

**Table 3: Absolute changes in unemployment rates and institutions: Group of unsuccessful countries<sup>13</sup>**

		UR (level)	UR(%)	TER(%)	TEE(%)	TAX(%)	RR(%)	EP	FT	TWA	ERTOT	CEN	COO	UC	UD
BEL	1960	3.3													
BEL	1975	4.6	1.3	9.7	8.0	17.7	5.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	5.2
BEL	1996	9.7	5.1	7.4	1.3	8.7	-8.0	0.1	-1.1	0.0	-0.3	0.0	0.0	0.0	3.3
CHE	1960	0.0													
CHE	1992	2.6	2.5	3.5	8.9	12.4	16.0	0.3	0.0	0.0	0.1	0.0	0.0	-0.3	-3.1
CHE	1996	3.5	0.9	0.9	1.5	2.4	8.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	0.0
DEU	1961	0.7													
DEU	1975	4.0	3.3	4.9	4.1	9.1	-1.0	0.2	0.0	0.0	0.1	0.0	0.0	3.3	1.2
DEU	1996	9.0	5.0	2.3	1.0	3.3	-2.0	0.0	-1.1	-0.1	-0.4	0.0	0.0	4.3	-5.5
FIN	1960	1.4													
FIN	1977	5.9	4.5	12.9	12.9	25.8	22.0	0.0	1.0	0.0	0.3	0.0	0.0	0.0	12.9
FIN	1992	13.2	7.2	2.9	0.5	3.5	-5.5	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	11.3
FIN	1996	16.1	2.9	2.0	3.4	5.3	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
FRA	1960	1.5													
FRA	1975	4.1	2.7	9.2	1.4	10.6	-2.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	-2.4
FRA	1996	12.3	8.2	6.6	7.1	13.7	14.0	0.0	-1.3	0.0	-0.4	0.0	0.0	10.0	-10.9
ITA	1960	6.5													
ITA	1996	12.0	5.5	7.6	9.4	17.0	1.0	0.3	-0.6	0.0	-0.1	2.0	1.0	19.4	2.7
SWE	1960	1.7													
SWE	1992	5.3	3.5	30.3	0.9	31.1	6.5	0.0	-0.5	0.0	-0.2	-1.0	-1.0	14.4	30.2
SWE	1996	10.0	4.7	0.2	0.7	0.9	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.5

<sup>13</sup> For the replacement rates, we refer to the year 1961 instead of 1960. When data were missing in 1996, we use the last year available (1994 or 1995).

Table 4: *Absolute changes in unemployment rates and institutions: Successful countries*<sup>14</sup>

		UR (level)	UR(%)	TER(%)	TEE(%)	TAX(%)	RR(%)	EP	FT	TWA	ERTOT	CEN	COO	UC	UD
AUS	1960	1.4													
AUS	1975	4.6	3.1	1.5	6.0	7.4	5.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.3	-0.2
AUS	1993	11.0	6.4	-2.8	-0.8	-3.6	5.0	0.8	0.0	0.0	0.3	-1.0	-1.0	-7.5	-13.9
AUS	1996	8.6	-2.4	6.0	0.3	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
DEN	1960	2.3													
DEN	1974	3.6	1.3	0.1	17.9	17.9	31.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
DEN	1983	11.6	7.9	1.0	-0.1	0.9	1.5	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	13.1
DEN	1987	5.4	-6.1	0.1	1.2	1.3	-4.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	-1.8
DEN	1993	10.1	4.7	-1.1	-0.6	-1.7	21.0	0.0	0.0	-2.0	-0.7	0.0	0.0	0.0	3.2
DEN	1996	6.0	-4.1	?	?		-2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GBR	1960	1.4													
GBR	1977	5.3	3.9	8.0	5.8	13.8	1.0	0.2	0.0	0.0	0.1	0.0	0.0	5.6	8.6
GBR	1986	11.8	6.5	-0.5	-2.2	-2.7	-5.0	0.0	0.0	0.0	0.0	0.0	0.0	-14.5	-4.5
GBR	1996	8.2	-3.6	-1.1	-1.0	-2.1	-2.0	0.0	0.0	0.0	0.0	-1.0	0.0	-7.7	-10.4
IRE	1960	5.6													
IRE	1976	9.1	3.5	4.1	7.2	11.3	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
IRE	1987	17.8	8.7	1.5	5.5	7.1	6.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	-3.5
IRE	1996	11.9	-5.9	0.3	-0.6	-0.3	-4.0	0.1	0.0	0.0	0.0	0.0	1.0	0.0	-1.9
NLD	1960	1.5													
NLD	1975	5.3	3.8	13.5	5.5	19.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.3
NLD	1984	12.2	6.9	1.4	0.8	2.2	17.0	0.3	0.0	0.0	0.1	0.0	1.0	-1.5	-6.7
NLD	1996	6.3	-5.9	-14.3	7.5	-6.8	-5.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0	7.0	-4.0
NZL	1960	0.1													
NZL	1983	5.7	5.6	0.5	22.5	23.0	-11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.1
NZL	1992	10.3	4.7	-1.6	-1.7	-3.3	-1.0	0.0	0.0	0.0	0.0	-1.0	0.0	-18.0	-13.1
NZL	1996	6.1	-4.2	0.0	-20.8	-20.8	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	-18.0	-9.9

<sup>14</sup> For the replacement rates, we refer to the year 1961 instead of 1960. When data were missing in 1996, we use the last year available (1994 or 1995).

**Table 5: Absolute changes in unemployment rates and institutions between important date points**  
*Groups of stable countries*<sup>15</sup>

		UR (level)	UR(%)	TER(%)	TEE(%)	TAX(%)	RR(%)	EP	FT	TWA	ERTOT	CEN	COO	UC	UD
AUT	1960	2.6													
AUT	1985	3.6	1.0	7.7	7.4	15.1	28.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11.0
AUT	1996	4.4	0.8	0.4	-3.2	-2.8	-3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.2
CAN	1960	6.5													
CAN	1982	11.0	4.5	4.9	8.2	13.1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	6.8
CAN	1996	9.7	-1.3	5.5	1.7	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	2.0
JPN	1960	1.7													
JPN	1985	2.6	1.5	6.2	4.0	10.2	-2.0	0.3	0.0	-1.0	-0.2	0.0	0.0	-6.2	-6.8
JPN	1996	3.4	0.8	0.7	1.4	2.0	-9.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.4	-4.3
NOR	1960	1.2	0.0	0.0	0.0	0.0	0.0								
NOR	1989	5.0	3.8	11.8	1.8	13.7	35.0	0.0	-1.0	0.0	-0.3	0.0	0.0	9.1	-0.2
NOR	1996	4.9	-0.1	0.0	-0.4	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	1.9
USA	1960	5.5													
USA	1985	7.2	1.7	11.4	2.8	14.1	8.0	0.0	0.0	0.0	0.0	0.0	0.0	-8.3	-6.3
USA	1996	5.3	-1.9	1.6	0.3	1.9	-3.2	0.0	0.0	0.0	0.0	0.0	0.0	-4.0	-3.0

<sup>15</sup> For the replacement rates, we refer to the year 1961 instead of 1960. When data were missing in 1996, we use the last year available (1994 or 1995).

**Table 6: Estimation Results (I)**

Dependent variable : Standardised Unemployment Rate (%)				
	(1)	(2)	(3)	(4)
<b>Driving macro variable</b>				
change in inflation	<b>-0.23 ( 0.04 )</b>	<b>-0.21 ( 0.03 )</b>	<b>-0.22 ( 0.04 )</b>	<b>-0.22 ( 0.04 )</b>
<b>Independent institutions</b>				
tax rate (0-1)	<b>0.27 ( 0.02 )</b>	<b>0.32 ( 0.02 )</b>	<b>0.31 ( 0.02 )</b>	<b>0.27 ( 0.02 )</b>
replacement rate (0-1)	<b>0.06 ( 0.02 )</b>	0.00 ( 0.02 )	0.00 ( 0.02 )	<b>0.04 ( 0.02 )</b>
employment protection (total) (0-1)	<b>-0.04 ( 0.02 )</b>	0.00 ( 0.02 )	0.00 ( 0.02 )	<b>-0.06 ( 0.02 )</b>
union density (0-1)	0.00 ( 0.02 )	<b>0.07 ( 0.03 )</b>	0.00 ( 0.02 )	0.00 ( 0.02 )
union coverage (0-1)	<b>-0.07 ( 0.03 )</b>	<b>-0.06 ( 0.03 )</b>	0.00 ( 0.03 )	0.00 ( 0.03 )
coordination index (1/2/3)	0.00 ( 0.00 )	0.00 ( 0.00 )	0.00 ( 0.00 )	0.00 ( 0.00 )
<b>Complementarities*</b>				
tax * rr		<b>0.51 ( 0.11 )</b>	<b>0.75 ( 0.10 )</b>	
tax * ertot		<b>-0.52 ( 0.07 )</b>		<b>-0.29 ( 0.05 )</b>
tax * ud		-0.09 ( 0.11 )		
tax * uc		<b>0.64 ( 0.07 )</b>		
tax * coo		<b>0.04 ( 0.02 )</b>		
rr * ertot			<b>-0.33 ( 0.06 )</b>	
rr * ud				
rr * uc				
rr * coo			<b>0.06 ( 0.02 )</b>	
ertot * ud				
ertot * uc				<b>0.17 ( 0.06 )</b>
ertot * coo				
ud * uc				
ud * coo				
uc * coo				
Adjusted R-squared	0.65	0.73	0.69	0.67
Hausman test of Ho : RE vs. FE (p-value)	24.1 (0.0)	76.5 (0.0)	37.4 (0.0)	41.1 (0.0)
F-Test of Ho :a.b vs ai.bi (p-value)	29.8 (0.0)	33.2 (0.0)	28.0 (0.0)	25.2 (0.0)
F-Test of Ho:ai.b vs ai.bi (p-value)	14.6 (0.0)	15.9 (0.0)	13.2 (0.0)	12.8 (0.0)
Leamer critical value	8.9	11.4	10.2	9.8

- (i) all regressions contain country fixed effects
- (ii) tax : tax rate; rr : replacement rate; ertot : employment protection regulation; uc : union coverage, ud : union density; coo : coordination index
- (iii) Fisher test (a,b=a<sub>i</sub>,b) : test for the presence of individual effects (intercepts); Fisher test (a<sub>i</sub>,b=a<sub>i</sub>,b<sub>i</sub>) : test for coefficient homogeneity, assuming individual intercepts), Leamer alternative critical value :  $F_{crit}=(T-k)/p(T^p/T-1)$ , where T=total number of observations, k=number of estimated parameters in the unrestricted model and p=number of restrictions.
- (iv) In bold : Values significant at 5% level; into brackets :standard errors
- (v) Number of observations : 591



**Table 6: Estimation Results (II)**

Dependent variable : Standardised Unemployment Rate (%)				
	(5)	(6)	(7)	(8)
<b>Driving macro variable</b>				
change in inflation	<b>-0.22 ( 0.04 )</b>	<b>-0.22 ( 0.03 )</b>	<b>-0.22 ( 0.04 )</b>	<b>-0.19 ( 0.03 )</b>
<b>Independent institutions</b>				
tax rate (0-1)	<b>0.28 ( 0.02 )</b>	<b>0.28 ( 0.02 )</b>	<b>0.29 ( 0.02 )</b>	<b>0.29 ( 0.02 )</b>
replacement rate (0-1)	<b>0.04 ( 0.01 )</b>	<b>0.05 ( 0.01 )</b>	<b>0.02 ( 0.02 )</b>	0.00 ( 0.02 )
employment protection (total) (0-1)	-0.03 ( 0.02 )	<b>-0.10 ( 0.02 )</b>	<b>-0.06 ( 0.02 )</b>	0.00 ( 0.02 )
union density (0-1)	<b>0.14 ( 0.03 )</b>	<b>0.11 ( 0.03 )</b>	<b>0.04 ( 0.02 )</b>	<b>0.16 ( 0.03 )</b>
union coverage (0-1)	<b>-0.19 ( 0.03 )</b>	<b>-0.31 ( 0.04 )</b>	<b>-0.07 ( 0.03 )</b>	<b>-0.22 ( 0.03 )</b>
coordination index (1/2/3)	<b>0.01 ( 0.00 )</b>	<b>0.02 ( 0.01 )</b>	0.00 ( 0.00 )	0.00 ( 0.00 )
<b>Complementarities*</b>				
tax * rr				<b>0.66 ( 0.11 )</b>
tax * ertot				<b>-0.51 ( 0.08 )</b>
tax * ud	<b>-0.21 ( 0.09 )</b>			<b>-0.32 ( 0.11 )</b>
tax * uc		<b>0.45 ( 0.08 )</b>		<b>0.64 ( 0.09 )</b>
tax * coo			<b>-0.07 ( 0.02 )</b>	<b>0.09 ( 0.03 )</b>
rr * ertot				
rr * ud				<b>0.17 ( 0.08 )</b>
rr * uc		<b>-0.30 ( 0.09 )</b>		<b>-0.40 ( 0.09 )</b>
rr * coo			<b>0.07 ( 0.02 )</b>	
ertot * ud	<b>0.32 ( 0.06 )</b>			<b>0.46 ( 0.07 )</b>
ertot * uc	<b>0.61 ( 0.08 )</b>	<b>0.33 ( 0.08 )</b>		<b>0.21 ( 0.07 )</b>
ertot * coo			<b>0.06 ( 0.02 )</b>	<b>-0.04 ( 0.02 )</b>
ud * uc		<b>-0.67 ( 0.09 )</b>		<b>-0.42 ( 0.10 )</b>
ud * coo	<b>-0.08 ( 0.02 )</b>		<b>-0.08 ( 0.02 )</b>	
uc * coo		<b>-0.09 ( 0.03 )</b>		<b>-0.11 ( 0.02 )</b>
<b>Constant term</b>				
Adjusted R-squared	0.70	0.71	0.67	0.78
Hausman test of Ho : RE vs. FE (p-value)	47.8 (0.0)	47.9 (0.0)	27.8 (0.0)	129.5 (0.0)
F-Test of Ho :a.b vs ai.bi (p-value)	24.3 (0.0)	21.7 (0.0)	26.8 (0.0)	26.4 (0.0)
F-Test of Ho:ai.bi vs ai.bi (p-value)	10.8 (0.0)	8.6 (0.0)	12.5 (0.0)	11.3 (0.0)
Leamer critical value	10.60	10.60	9.30	14.80

- (i) all regressions contain country fixed effects
- (ii) tax : tax rate; rr : replacement rate; ertot : employment protection regulation;  
uc : union coverage, ud : union density; coo : coordination index
- (iii) Fisher test (a,b=a<sub>i</sub>,b) : test for the presence of individual effects (intercepts);  
Fisher test (a<sub>i</sub>,b=a<sub>i</sub>,b<sub>i</sub>) : test for coefficient homogeneity, assuming individual  
intercepts), Leamer alternative critical value : Fcrit=(T-k)/p(T<sup>p</sup>/T-1), where  
T=total number of observations, k=number of estimated parameters in the  
unrestricted model and p=number of restrictions.
- (iv) In bold : Values significant at 5% level; into brackets :standard errors
- (v) Number of observations : 591

Table 7: Prediction power of models (1) and (8)

<b>Country</b>	<b>Changes</b>		<b>Actual</b>	<b>Errors</b>	
	<b>Predicted (1)</b>	<b>Predicted (8)</b>		<b>Model (1)</b>	<b>Model (2)</b>
<b>BEL</b>	3.1	3.1	5.3	2.2	2.2
<b>CHE</b>	1.9	2.8	2.2	0.3	0.6
<b>DEU</b>	1.7	2.2	5.8	4.0	3.6
<b>FIN</b>	-0.3	0.4	4.2	4.5	3.8
<b>FRA</b>	5.2	7.8	8.7	3.5	0.9
<b>ITA</b>	3.5	3.9	5.3	1.8	1.3
<b>SWE</b>	-0.8	2.0	6.2	7.0	4.2
<b>GBR</b>	-0.1	0.5	-1.7	1.6	2.2
<b>IRL</b>	-0.5	-1.1	-2.3	1.7	1.2
<b>NLD</b>	-3.2	-5.5	-4.8	1.6	0.6
<b>AUT</b>	-0.5	-0.8	0.7	1.2	1.5
<b>CAN</b>	1.6	1.4	0.2	1.4	1.2
<b>JPN</b>	1.3	-0.4	0.1	1.1	0.6
<b>NOR</b>	-0.9	-0.5	1.0	1.9	1.5
<b>USA</b>	0.9	0.1	-1.0	1.9	1.1
<b>Average</b>				<b>2.4</b>	<b>1.8</b>

Table 8: Simulation results

Country	Period	Actual Change	Predicted change																	
			Total	$\Delta^2 p$	Direct								Interaction effects							Policy interaction total
					tax	rr	ep	ud	uc	coo	total	tax	rr	ep	ud	uc	coo	total		
BEL	1975-1994	4.5	3.1	0.2	3.0	0.0	0.0	0.6	0.0	0.0	3.6	-0.5	-0.1	0.0	0.2	0.0	0.0	-0.4	-0.3	
CHE	1991-1994	2.2	2.8	0.2	1.2	0.0	0.0	0.0	0.4	0.0	1.7	0.4	0.4	0.0	0.0	-0.1	0.0	0.7	0.2	
DEU	1974-1994	5.8	2.2	0.2	1.3	0.0	0.0	-0.6	-1.0	0.0	-0.3	0.1	0.0	1.0	-0.3	0.7	0.0	1.5	0.8	
FIN	1992-1995	4.2	0.4	-0.2	-0.2	0.0	0.0	0.8	0.0	0.0	0.6	0.1	0.1	0.0	-0.3	0.0	0.0	-0.1	0.0	
FRA	1974-1994	8.7	7.8	0.4	4.1	0.0	0.0	-1.9	-1.9	0.0	0.3	0.1	-0.6	2.0	-0.6	2.0	0.0	2.8	4.2	
ITA	1974-1994	5.3	3.9	0.7	3.4	0.0	0.0	-0.2	-2.8	0.0	0.3	-2.4	0.2	0.6	-0.1	3.6	-0.3	1.7	1.3	
SWE	1991-1993	6.2	2.0	-0.3	-0.4	0.0	0.0	0.9	-0.4	0.0	0.0	0.3	0.0	0.0	0.3	0.2	1.1	2.0	0.2	
GBR	1986-1994	-1.7	0.5	0.0	-0.7	0.0	0.0	-1.6	2.1	0.0	-0.2	0.2	-0.1	0.0	0.4	0.4	0.0	1.0	-0.3	
IRL	1987-1990	-2.3	-1.1	-0.3	-0.2	0.0	0.0	-0.3	0.0	0.0	-0.5	-0.2	0.1	0.0	0.4	0.0	-0.6	-0.3	0.0	
NLD	1984-1994	-4.8	-5.5	-0.1	-3.0	0.0	0.0	-0.8	-0.9	0.0	-4.7	-1.4	-0.4	0.8	0.1	0.3	0.0	-0.6	-0.1	
AUT	1985-1995	0.7	-0.8	0.0	-0.5	0.0	0.0	-1.5	0.0	0.0	-2.0	-0.4	0.1	0.0	1.5	0.0	0.0	1.2	0.0	
CAN	1982-1994	0.2	1.4	-0.3	2.0	0.0	0.0	0.2	0.2	0.0	2.5	-0.9	0.0	0.0	0.0	0.1	0.0	-0.8	0.0	
JPN	1985-1994	0.1	-0.4	0.1	0.8	0.0	0.0	-0.7	0.9	0.0	1.0	-0.6	0.0	0.7	-1.1	-0.5	0.0	-1.6	0.1	
NOR	1989-1994	1.0	-0.5	-0.3	-0.7	0.0	0.0	0.2	0.2	0.0	-0.3	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
USA	1985-1994	-1.0	0.1	0.0	0.8	0.0	0.0	-0.6	1.1	0.0	1.3	-0.3	-0.4	0.0	0.1	-0.4	0.0	-0.9	-0.2	

## Appendices

### APPENDIX 1 : THE BARGAINING SOLUTION

The bargaining program can be written as follows:

$$\max_{w_{i,t}} B = \max_{w_{i,t}} (UR_{i,t})^b (FR_{i,t})^{1-b}, \quad (\text{A.1})$$

where the first order condition can be written as follows :

$$b \frac{\partial UR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{UR_{i,t}} + (1-b) \frac{\partial FR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{FR_{i,t}} = 0, \quad (\text{A.2})$$

We now calculate the value of the two terms on the left-hand side. We know that:

$$UR_{i,t} = L_{i,t} \left( (W_{i,t} - U_t) - \sum_{j \neq i} L_{j,t} (W_{j,t} - U_t) \right). \quad (\text{A.3})$$

The first term of the first order condition can therefore be written as follows:

$$\begin{aligned} b \frac{\partial UR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{UR_{i,t}} &= b \frac{\partial L_{i,t}}{\partial w_{i,t}} \frac{w_{i,t} \left( (W_{i,t} - U_t) - \sum_{j \neq i} L_{j,t} (W_{j,t} - U_t) \right)}{L_{i,t} \left( (W_{i,t} - U_t) - \sum_{j \neq i} L_{j,t} (W_{j,t} - U_t) \right)} \\ &\quad + b \frac{\partial (W_{i,t} - U_t)}{\partial w_{i,t}} \frac{w_{i,t}}{(W_{i,t} - U_t) - \sum_{j \neq i} L_{j,t} (W_{j,t} - U_t)} \end{aligned} \quad (\text{A.4})$$

The first term on the right hand side can easily be simplified and collapses to the elasticity of labour demand. In our framework, the elasticity of demand is constant :

$$e = - \frac{\partial L_t^c}{\partial w_t^c} \frac{w_t^c}{L_t^c} = \frac{1}{m}, \quad (\text{A.5})$$

where  $m = 1 - a(1-h)$ .

We then get the following expression:

$$b \frac{\partial UR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{UR_{i,t}} = -be + b \frac{\partial (W_{i,t} - U_t)}{\partial w_{i,t}} \frac{w_{i,t}}{(W_{i,t} - U_t) - \sum_{j \neq i} L_{j,t} (W_{j,t} - U_t)}. \quad (\text{A.6})$$

$$\text{Since } W_{i,t} - U_t = w_{i,t}(1+f) - b, \quad (\text{A.7})$$

$$\frac{\partial(W_{i,t} - U_t)}{\partial w_{i,t}} = 1 + qf, \quad (\text{A.8})$$

and we get the following expression for the first term of the left hand side Nash bargaining condition :

$$b \frac{\partial UR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{UR_{i,t}} = -be + b \frac{w_{i,t}(1+qf)}{(w_{i,t} - \sum_{j \neq i} L_{j,t} w_{j,t})(1+qf) - (1 - \sum_{j \neq i} L_{j,t})b_t}. \quad (\text{A.9})$$

We now turn to the second term on the left-hand side of the Nash bargaining program first order condition.

The firm union rents were defined as follows:

$$FR_{i,t} = P_{i,t} Y_{i,t}(L_{i,t}) - w_{i,t}(1+t+f)L_{i,t}. \quad (\text{A.10})$$

Consequently, we can write the second term of the Nash bargaining F.O.C. as:

$$\frac{\partial FR_{i,t}}{\partial w_{i,t}} \cdot \frac{w_{i,t}}{FR_{i,t}} = - \frac{(1+t+f)L_{i,t}w_{i,t}}{FR_{i,t}}, \quad (\text{A.11})$$

when combined with the F.O.C. of the firm determining labour demand, we get :

$$\frac{\partial FR_{i,t}}{\partial w_{i,t}} \cdot \frac{w_{i,t}}{FR_{i,t}} = - \frac{1-m}{m}, \quad (\text{A.12})$$

The first-order condition of the Nash bargaining program can be re-written as:

$$\begin{aligned} b \frac{\partial UR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{UR_{i,t}} + (1-b) \frac{\partial FR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{FR_{i,t}} &= 0 \\ b \frac{w_{i,t}(1+qf)}{(w_{i,t} - \sum_{j \neq i} L_{j,t} w_{j,t})(1+qf) - (1 - \sum_{j \neq i} L_{j,t})b} &= be + (1-b) \frac{1-m}{m} \end{aligned} \quad (\text{A.13})$$

Substituting for  $\epsilon$ ,

$$\begin{aligned} b \frac{\partial UR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{UR_{i,t}} + (1-b) \frac{\partial FR_{i,t}}{\partial w_{i,t}} \frac{w_{i,t}}{FR_{i,t}} &= 0 \\ b \frac{w_{i,t}(1+qf)}{(w_{i,t} - \sum_{j \neq i} L_{j,t} w_{j,t})(1+qf) - (1 - \sum_{j \neq i} L_{j,t})b} &= b + \frac{1-m}{m}. \end{aligned} \quad (\text{A.14})$$

$$bw_{i,t}(1+qf) = (b + \frac{1-m}{m}) \left[ (w_{i,t} - \sum_{j \neq i} L_{j,t} w_{j,t})(1+qf) - (1 - \sum_{j \neq i} L_{j,t})b_t \right]. \quad (A.15)$$

$$w_{i,t} = \frac{(b \frac{m}{1-m} + 1)}{1+qf} \left( b + \sum_{j \neq i} L_{j,t} (w_{j,t}(1+qf)) \right) \quad (A.16)$$

We compute the general equilibrium level by applying the symmetry assumption so that  $w_{i,t} = w_{j,t} = w_t^*$  and  $L_{i,t} = L_{j,t} = \frac{L_t^*}{n}$ , for all  $i, j$ .

$$w_t^* = \left( \frac{b \frac{m}{1-m}}{1 - \frac{L_t^*(n-1)}{n} \left( b \frac{m}{1-m} + 1 \right)} + 1 \right) \frac{b}{1+qf} \quad (A.17)$$

In the centralised case ( $n=1$ ):

$$w_t^*|_{n=1} = (b \frac{m}{1-m} + 1) \frac{b}{1+qf}. \quad (A.18)$$

If additionally unions have no bargaining power ( $b = 0$ ):

$$w_t^*|_{n=1, b=0} = \frac{b}{1+qf}. \quad (A.19)$$

It is also easy to show that  $\frac{\partial w_t^*}{\partial n} > 0$ .

We can also prove that the wage will always be positive (" $n$ ") since:

$$\left. \begin{aligned} n &\geq 2, \\ 0 \leq L_t^* \leq 1 &\Rightarrow 0 \leq \frac{L_t^*}{n} \leq \frac{1}{n}, \\ b \leq 1, m \leq 1 &\Rightarrow b \frac{m}{1-m} \leq 1 \Rightarrow b \frac{m}{1-m} + 1 \leq 2 \end{aligned} \right\} \Rightarrow 0 \leq \frac{L_t^*}{n} \left( b \frac{m}{1-m} + 1 \right) \leq \frac{2}{n} \leq 1.$$

The equilibrium of the economy is determined by the wage and labour demand equations:

$$w_t^* = \left( \frac{b \frac{m}{1-m}}{1 - \frac{L_t^*(n-1)}{n} \left( b \frac{m}{1-m} + 1 \right)} + 1 \right) \frac{b}{1+qf}, \quad (\text{A.19})$$

$$L_t^* = \left[ \frac{1-m}{w_t^*(1+t+f)} \right]^{\frac{1}{m}}. \quad (\text{A.20})$$

We re-write these expressions in a simple way:

$$\begin{cases} L_t^* = f(\mathbf{c}_{k=1\dots K}, w_t^*) \\ w_t^* = g(\mathbf{c}_{k=1\dots K}, L_t^*) \end{cases}, \quad (\text{A.21})$$

where  $\chi_{k=1,\dots,K}$  are institutional parameters.

We solve this system easily for the case  $n=1$ :

$$L_t^*|_{n=1} = \left( \frac{1-m}{\left( b \frac{1-m}{m} + 1 \right) \frac{b(1+t+f)}{1+qf}} \right)^{\frac{1}{m}}. \quad (\text{A.22})$$

For  $n>1$ , the following holds  $\frac{\partial L_t^*}{\partial b} < 0$ ,  $\frac{\partial L_t^*}{\partial m} < 0$ ,  $\frac{\partial L_t^*}{\partial t} < 0$ ,  $\frac{\partial L_t^*}{\partial n} < 0$ ,  $\frac{\partial L_t^*}{\partial f} < 0$ .

## APPENDIX 2: DESCRIPTION OF THE VARIABLES

Change in inflation: Absolute annual change in inflation, the latter defined as the relative increase in consumer prices. Source: Consumer price index, Luxembourg Income Study

Tax rate (%): Employment tax rate + Direct tax rate

Employment tax rate (%) : Indicator previously computed by the Centre for Economic Performance (London School of Economics), defined as the ratio between the sum of employers' contributions to social security contributions and contributions to private pension schemes (when applicable) and the compensation of employees net of these contributions. Source: CEP (1960-1992), OECD, National Accounts (1993-1996)

Direct tax rate (%) : Indicator previously computed by the Centre for Economic Performance (London School of Economics), defined as the ratio between the sum of households' contributions to social security net the employers' contributions and the income taxes, and the households' current receipts. Source: CEP (1960-1992), OECD, National Accounts (1993-1996)

Replacement rate (%) : Ratio between the unemployment benefit and the median wage. The indicator used for the unemployment benefit is a summary indicator, taking into account various durations and family situations. The ratio has been directly computed by OECD. Only odd years were available. We have computed even years by linear interpolation

Employment regulation: Built index indicating the strictness of employment regulation with respect to open-ended contracts, fixed-term (FT) contracts and temporary work agencies (TWA). See appendix (A.5)

Centralisation index: Index (1-3) characterising the degree of centralisation of the collective bargaining system, according to the privileged level of bargaining: 1:firm level, 2:industry level, 3:national level. Source: Bratt (1996), OECD, Employment Outlook (1997), Elmeskov *et al.* (1997)

Coordination index: Index (1-3) characterising the degree of consensus between the actors in the collective bargaining system. 1: low, 2:medium, 3:high. Source: Bratt(1996), OECD, Employment Outlook (1997), Elmeskov *et al.* (1997)

Union density (%): union density using OECD data, Bain & Price, Van Ruyssveldt, Visser

Union coverage index: union coverage, some observations interpolated, and using union density/coverage ratios, source : OECD



## **APPENDIX 3: KEY FOR THE BUILDING OF THE EMPLOYMENT PROTECTION INDICATOR**

### **PROTECTION OF OPEN-ENDED CONTRACTS**

#### *Administrative procedure :*

These marks are just added up according to the presence of the mentioned factors.

- 1 – Notification required (verbally or by letter)
- 1 – Grounds notification required (verbally or by letter)
- 1 – Notification to a third party required
- 1 – Authorisation of a third party

#### *Noticing period:*

- 0 – No notification period required
- 1 – < 2 months
- 2 – > 2 months

#### *Severance payment:*

- 0 – No notification period required
- 1 – < 2 months
- 2 – > 2 months

#### *Special provisions:*

- 1 – Tighter protection of special categories of workers
- 2 – Companies must provide retraining courses
- Definition of unfair dismissals (and provisions with respect to it)
- 0 – Discrimination and no economic grounds
- 1 – when social considerations haven't been taken into account
- 1 – when discrimination in the selection procedure of dismissals
- 1 – when no consultation with the workforce has been undertaken
- 2 – when re-training the labour force must be attempted
- 3 – when worker capability cannot be a basis for dismissal
- 1 – when a ceiling apply to appeal against unfair dismissal

#### *Collective dismissals (special provisions) :*

- 1 – Conciliation with workforce / third party required
- 1 – redundancies must be accompanied by a social plan
- 2 – authorisation of a third party required
- 2 – when specific conditions must be fulfilled

## **REGULATION OF FIXED TERM CONTRACTS**

### *Purpose:*

- 0 – No limit
- 1 – Specific restrictions (some jobs or sectors are excluded)
- 2 – Particular circumstances (increase in the amount of work, temporary replacement of a worker)
- 2 – Wide restrictions (limited to some jobs or sectors)
- 3 – Objective reasons (task temporary in nature)
- 4 – Not allowed
- 1 – If can be used for unemployed and apprentices (if restrictions exist otherwise)

### *Duration:*

- 0 – No limit
- 1 – Limited to 1 year, only few renewals possible
- 2 – no renewal possible

## **TEMPORARY WORK AGENCIES REGULATION**

### *Purpose:*

- 0 – No limit
- 1 – Specific restrictions (some jobs or sectors are excluded)
- 2 – Particular circumstances (increase in the amount of work, temporary replacement of a worker)
- 2 – Wide restrictions (limited to some jobs or sectors)
- 3 – Objective reasons (task temporary in nature)
- 4 – Not allowed
- 1 – If can be used for unemployed and apprentices (if restrictions exist otherwise)

### *Duration:*

- 0 – No limit
- 1 – Limited to 1 year, only few renewals possible
- 2 – no renewal possible

We graded the evolution of the employment regulation for all the countries, over the period 1960-1996<sup>16</sup>. We then calculated three indicators, averaging the grades related to each component described above. We normalised the highest value for each indicator to 1, so as to re-scale our indicators in a range [0,1]. We then

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<sup>16</sup> Full description of the evolution and the data are available from the authors upon request.

calculated the average of the three indicators to obtain the summary index of employment protection regulation.